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The 1983 Lamb Wind-Chill Forecasting Trial in S England

by J R Starr

Agricultural Memorandum 989

Introduction

As part of a study (in collaboration with the VI Centre, MAFF, Reading) to obtain detailed information on lamb mortality in a lowland sheep flock, meteorological observations were made at Rushall Manor Farm, Bradfield near Reading between 1976 and 1979.

These data were interpreted in terms of critical environmental heat demands likely to lead to lamb field deaths. In subsequent seasons these 'critical' data were used as a basis for 'wind-chill' forecasting trials. These trials, in 1980 and '81, are reported in Agricultural Memoranda 934, 949 and in Starr (1981).

The 1982 trial operated through RAF Benson Meteorological Office and Bristol Weather Centre. The benign spring weather meant that the system was not really tested. Accordingly with the agreement of Met 07a, the trials were continued free of charge for the 1983 lambing season.

The withdrawal of Benson from Public Service commitments meant that the Oxford, Berks, North Hants and Wiltshire areas were served entirely by Bristol Weather Centre (a total of seven co-operating farmers).

The opportunity was taken to extend the trial to Hants, Surrey and W Sussex through the co-operation of Mr Keith Best, Southampton Weather Centre and Miss Rachel Cox, Animal Husbandry Adviser, ADAS, Winchester. Four farms participated.

The 1983 trials

The season produced testing sequences for the system. To quote Mr Mike Bibb, Bristol Weather Centre: "It was a particularly difficult year with much of the precipitation being showery and as such it must have been a searching test of our effectiveness."

The demand on the forecasters to make a Yes/No forecast for rainfall over the 6 x 4 hour periods is, of course, the most searching aspect of the system. If the farmer misses out on the showers the actual wind-chill factor will be much less than the forecast value. This was partly resolved by taking -

i. the probability of light showers as meaning 'NO' rain since the lamb could well shelter from a light shower or at least dry out quickly;

ii. the probability of heavy showers forecast as 'YES' rain.

As the season progressed Bristol decided to provide two wind-chill factors appropriate to this forecast shower severity. The farmer could interpret the factors accordingly. The dates between which the farmers with Bristol took forecasts are given in Appendix I.

Farmers' Comments

N M Bridges, Farmer Manager, Cirencester, wrote to Mr M Bibb as follows:

> "... we have reduced our mortality due to hypothermia this year in what is arguably one of the worst spells of weather at lambing for some years.
>
> I found it very useful to have very detailed weather forecasts and wind-chill forecast data to hand when making decisions on turnout."

In his Report on Lambing (Appendix II), Mr Bridges noted:

> "Without doubt this service was a major aid in making the decision on when and what to turn out.
>
> Fourteen of the thirty six days gave us forecast wind-chill factors of 80 or less, indicating it was of low risk to turn out ... we were forced to turn out ewes and lambs on days when the forecast factor was 81-88 although only strong lambs were put out on these days.
>
> Records show we only lost two lambs in the field due to exposure. We have without doubt reduced the number of deaths attributable to exposure following turn out. A fair measure of credit must go to the staff of Bristol Weather Centre for their help."

From Mr D Harbottle, Faccombe Estates, near Andover, Hants

> '... the trial forecast proved far more useful than last year although on several occasions what was forecasted failed to materialise and we held lambs in when they could have easily gone out.
>
> '... we (Mr Harbottle and his new shepherd) felt that overall it was a very worthwhile exercise. Obviously it is very difficult for ... (Bristol WC) to be entirely specific some 60 miles east of them and therefore they must be inclined towards generalisations and this does fall down from time to time.
>
> 'However I am sure that anyone lambing a considerable number of ewes with limited holding space must find the services beneficial.'

Writing to Mr Keith Best, Mr Janaway of Basingstoke comments:

> "I found the figures you gave most helpful..."

(He suggested that a forecast for up to 3 days would be valuable since he had enough space to hold ewes and lambs for up to 3 days).

The problems that can be posed by showery weather are highlighted in the pertinent comments of Mr Dartnall of Temple Farm, near Malborough -

"... Unfortunately I did not find the Lamb Wind Chill Factor anywhere near as accurate this year as it was last. In many cases the figure was too high for the conditions that later developed that day, for example, on the 29th March, 1983 the factor was 97, when in fact we only actually had 2.5 mls of rain. There were several occasions when there was a very high figure and yet it was warm, humid and misty and yet on other occasions the same figure was followed by much colder, wetter weather and to me there was no comparison between the two days and yet Bristol WC forecasted that they would be roughly the same. However, there was one advantage in actually physically talking to a Meteorological Officer. Whether the problem was in the interpretation of the data but it seemed to me that the quality of advice wasn't the same as the year previous.

I think this system still has potential but needs refinements ..."

Bristol subsequently developed the 'two-index system' for the showery situation to minimise the likelihood of such errors.

Verification exercise

A verification exercise was carried out by Southampton Weather Centre for the recipients who were all in the north-east of Hampshire. Interpretations of maximum and minimum temperature from Long Sutton were therefore appropriate together with subjective assessments of wind strength and rainfall from SWC records and LWC's Daily Weather Summary.

Briefly, seven of the fifty one forecasts issued predicted the index exactly whilst the error of the remainder did not show a particular bias.

'As one would expect' comments S Met O 'the greatest forecast errors occurred on occasions when this precipitation prediction was unsuccessful... the forecaster is faced with a Yes/No decision regarding rainfall and he is often uncertain whether intermittent precipitation is significant with respect to the wetting of a young fleece.'
(Bristol WC partly resolved this problem, as discussed earlier under 'The 1983 Trials').

Summary

The forecasting scheme has been tried under a variety of conditions from benign (most of spring 1982) to severe (several nights in 1981 and 1983). The showery spring of 1983 highlighted difficulties particularly since the Index is critically dependent on rainfall and its duration. Nevertheless, the availability of a forecaster to discuss such problems with the farmer and to suggest 'limits' for the Wind-chill index associated with whether the showers were heavy and prolonged or not clearly was vital and was appreciated by several farmers. Over the three seasons of the trial it was clear that farmers were prepared to adjust their management in the light of the wind-chill forecasts and on several occasions lamb mortality, due to exposure, was apparently dramatically diminished (eg at Rushall Manor Farm 1981, as reported in Ag Mem 934).

The scheme will over-estimate the wind-chill under daytime conditions of strong insolation, conditions anyway in which the index is likely to be low. It is under severe night-time conditions the index is more realistic, integrating as it does the effects of rain, wind and temperature.

The scheme is presented in a form which tests the forecaster without making unreasonable demands and offers the opportunity for the forecaster to be involved with the participating farmer since interpretation of the index (eg into day/night totals or for showery conditions) may well be necessary.

(Example of proforma used by Bristol Weather Centre is in Ag Mem 949).

Cost

S Met O Bristol considers that the service could be marketed for some £90 (a figure considered to be cost-effective by Mr Bridges), but with a reduction to about £60 to £75 for Consultancy Customers.

Promotion

Mr Bridges notes that the service will have to be promoted carefully as the effects of disease may give misleading results (and give rise to misleading interpretations) and some farmers might not have the facilities to keep ewes and lambs under cover during a prolonged period of bad weather. The scheme is based on work with lowland flocks, and would not necessarily be appropriate to the more rigorous hill climate with the more hardy breeds of sheep and lower lambing percentages.

Acknowledgements

The forecast trials were set up with the co-operation of Mr Gordon Hughes, Livestock Husbandry, Miss Rachel Cox, ADAS, Winchester and Miss Ann Perez (ADAS, Oxford). The Senior Meteorological Officers and their staff at Bristol and Southampton enthusiastically produced the wind-chill forecasts and made many constructively critical points. P Met O Plymouth also showed great interest in the scheme.

The following farmers took part in the trials:

Messrs Howes, Soames, Brown, Dartnall, Bridges, Bishop and Harbottle received forecasts from Bristol, and Messrs Janaway and Bulter, and Manor Farms and Stud, Arlesford, Southampton. Their help is most gratefully acknowledged.

References

Starr J R (1981) Wind-chill in lambs - background studies and forecasting trials in seasons 1980-81. Agricultural Memorandum 934.

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Any comments or suggestions on this paper should be referred to the author.

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Appendix I

Forecasts supplied by Bristol Weather Centre - 1983.

Customer	Period
Hawes	5 March to 19 April
Soames	22 " " 13 "
Dartnall	11 " " 13 "
Bridges	10 " " 16 "
Bishop	21 " " 25 "
Harbottle	24 " " 25 "
Brown	21 " " 30 March

Appendix II

Abbey Home Farms, Norcote, Cirencester

Report on Lambing 1983

The main period of lamb drop at Abbey Home Farms in 1983 was 10th March to 14th April. The weather during that time was very wet and cold and severely handicapped our management of the ewes and lambs. Of the thirty six days in that period we recorded rain on thirty four of them. Although rainfall totals, were not high (76 mm), the precipitation added extra "bite" to the cold winds and generally low temperature being experienced.

Our lambing proceeded quite steadily throughout this period with generally good strong lambs being born. The ewes, both shorn and unshorn were fit and healthy throughout.

The preocedure we normally follow at lambing time is as follows.

- Ewes penned in groups of 50 pre-lambing.

- After lambing, 24 hours in individual mothering pen with her lambs.

- 24-72 hours in post lambing yards in bunches of 20 ewes and lambs.

- 72 hours turnout to grass.

Throughout this period the ewe is fed a high protein concentrate feed, providing in theory sufficient energy and protein intake to support her and two lambs. Fodder is high quality silage.

This year, because of such adverse weather conditions, ewes and lambs were kept inside for much longer periods, up to 8 days before being turned out. The implications of this were twofold. Firstly the newborn lamb is exposed to a heavy disease pressure in the first week of life, this was indicated by the high level of incidence of navel-ill and pasteurella infections. Secondly the ewe does not receive the benfit of fresh grass soon after lambing in order to boost milk supply.

In the case of pasteurella, the ewes and lambs are protected as far as possible by vaccination but disease pressure was so high that this protection was overcome, resulting in 63 lamb deaths attributable to pasteurella.

Navel ill - an infection gaining access through the unhealed umbilical cord had a high incidence this year with some 120 lambs requiring treatment. Normally this condition is regarded as a management deficiency, however, three antibiotic/iodine application methods were tried and evaluated (under veterinary direction).

a) navel dipping
b) navel spraying
} with strong iodine solution

c) antibiotic spray

It was concluded that as in the case of pasteurella, disease pressure was so high as to overcome preventative methods.

The ewe's ability to lactate heavily in the first week following parturition is normally boosted by access to fresh spring grass. For may ewes this year, this was not possible. An attempt to boost milk production was made by feeding high protein concentrates heavily for the first thnee weeks of lactation.

As an aid to making the turnout decision, this year we had the benefit of a more precise "windchill" stress factor forecasting service from the Bristol Weather Centre.

Briefly a forecast windchill factor is computed from inputs of wind speed, temperature and rainfall, expected in each four hour period for the next 24 hours.

If the windchill factor exceeds a set figure then risks of exposure to the lambs can be expected to increase.

Without doubt this service was a major aid in making the decision on when and what to turn out.

Fourteen of the thirty six days gave us forecast windchill factors of 80 or less indicating it was of low risk to turn out. Of these fourteen we turned out ewes and lambs on eleven of them. These remaining days proved too wet.

We were forced to turn out ewes and lambs on days when the forecast factor was 81-88 although only strong lambs were put out on those days.

Records show we only lost two lambs in the fields from exposure. This was concluded as we post mortem all dead lambs and two were dead from no aparrent disease. Deaths from pasteurella are fairly easy to identify from the appearance of the lungs (pneumonia is a major secondary infection with pasteurella).

Without doubt the poor weather conditions allied to the heavy disease pressure masked the true value of the windchill forecast. Our own situation is more fortunate than most as we have considerable under cover accomodation for ewes and lambs, allowing us to be more selective as to when we turn out.

Generally speaking, the windchill forecast was accurate enough to make reliable decisions based on it. Those days when there were discrepancies were when the rain was of a showery nature and thus much more difficult to predict.

In summary although a difficult year for lambing, we have aquitted ourselves well in terms of reducing lambs mortality (92 in 1983, 151 in 1982). We have without doubt reduced the number of deaths attributable to exposure following turnout. A fair measure of credit must go to the staff of Bristol Weather Centre for their help.